What is claimed is:

1. A process for producing a flat rolled steel product comprised of high strength, low alloy steel containing a hardness-promoting microalloy, the process comprising:

(a) casting molten steel to form a solid, as-cast steel product having a thickness, the as-cast product comprising austenite;

(b) hot charging the as-cast steel product into a furnace without first cooling the as-cast product to ambient temperature, such that a temperature of the as-cast product is maintained at a temperature above a recrystallization stop temperature of the austenite and above a precipitation temperature of the microalloy;

(c) transferring the as-cast product from the furnace to a first rolling apparatus;

(d) conducting a rough reduction step in the first rolling apparatus to reduce the thickness of the as-cast steel product by a first amount, thereby producing a rough-reduced steel product, wherein a temperature of the as-cast product entering the first rolling apparatus and a temperature of the rough-reduced product exiting the first rolling apparatus are above the recrystallization stop temperature and above the precipitation temperature of the microalloy;

(e) holding the rough-reduced product at a temperature above the recrystallization stop temperature and above the precipitation temperature of the microalloy for a time sufficient to permit substantially complete recrystallization of the austenite and thereby reduce a grain size of the austenite;

(f) transferring the rough-reduced product to a second rolling apparatus;

(g) conducting a final reduction step in the second rolling apparatus to reduce the thickness of the rough-reduced product by a second amount, thereby producing a hot rolled steel product, wherein the second amount of thickness reduction is less than the first amount produced in the first rolling apparatus, and

wherein a temperature of the rough-reduced product entering the second rolling apparatus and a temperature of the hot rolled product exiting the second rolling apparatus are above the precipitation temperature of the microalloy and wherein the temperature of the rough-reduced product entering the second rolling apparatus is above the recrystallization stop temperature; and

(h) cooling the hot rolled product to produce said flat rolled steel product, wherein the hot rolled product is cooled to a temperature which is less than the microalloy precipitation temperature and less than a temperature at which austenite transforms to ferrite.

2. The process of claim 1, wherein the as-cast steel product is hot charged into the furnace without first cooling the as-cast product to ambient temperature, such that the temperature of the as-cast product is maintained throughout steps (a) and (b) at said temperature above the recrystallization stop temperature of the austenite and above the precipitation temperature of the microalloy.

3. The process of claim 1, wherein the thickness of the as-cast steel product is from about 30 mm to about 200 mm.

4. The process of claim 1, wherein the thickness of the as-cast steel product is from about 50 mm to about 80 mm.

5. The process of claim 1, wherein the first amount of thickness reduction produced in the first rolling apparatus is from about 40 percent to about 60 percent of the thickness of the as-cast product.

6. The process of claim 1, wherein the second amount of thickness reduction produced in the second rolling apparatus is from about 90 to about 98 percent to about percent of the thickness of the rough-reduced product.

7. The process of claim 1, wherein the thickness of the hot rolled product is from about 1 mm to about 6 mm.

8. The process of claim 1, wherein the thickness of the hot rolled product is from about 1 mm to about 2 mm.

9. The process of claim 1, wherein the microalloy is comprised of vanadium and nitrogen and wherein the microalloy precipitation temperature is about 1050°C.

10. The process of claim 1, wherein the flat rolled steel product has a yield strength of at least about 70 ksi.

11. The process of claim 1, wherein the flat rolled steel product has a yield strength of at least about 80 ksi (550 MPa).

12. The process of claim 1, wherein the flat rolled product has a formability, as measured by n-value, within the range from about 0.1 to about 0.15.

13. The process of claim 1, wherein the first rolling apparatus comprises a rougher.

14. The process of claim 1, wherein the second rolling apparatus comprises a rolling mill comprising at least one rolling stand.

15. The process of claim 14, wherein the second rolling apparatus comprises a strip mill comprising a plurality of rolling stands, and wherein the rough-reduced product moves in one direction through the strip mill.

16. The process of claim 1, wherein step (d) comprises transferring the rough-reduced product along a heated run-off table from the first rolling apparatus to the second rolling apparatus.

17. The process of claim 1, wherein the time sufficient to permit complete recrystallization of the austenite is from about 15 seconds to about 25 seconds and wherein the complete recrystallization results in at least about 90 percent of the austenite grains within the rough-reduced product having a grain size within the range of from about 100μm to about 400μm.

18. The process of claim 1, wherein the temperature at which the rough-reduced product is held in step (c) is from about 1020°C to about 1150°C.

19. An apparatus for producing a formable flat rolled steel sheet product of high strength, low alloy steel containing a hardness-promoting microalloy, the apparatus comprising:

(a) a casting apparatus in which molten steel is solidified to produce an as-cast steel product having a thickness, the as-cast product comprising austenite;

(b) a tunnel furnace in which the as-cast product is maintained at a temperature above a precipitation temperature of the microalloy and above a recrystallization stop temperature of the austenite;

(c) a rougher in which the thickness of the as-cast product is reduced by a first amount, thereby producing a rough-reduced product, the rougher being in sufficiently close proximity to the tunnel furnace that a temperature of the as-cast product entering the rougher is above the precipitation temperature of the microalloy and the recrystallization stop temperature;

(d) a heating apparatus for maintaining the rough-reduced product at a temperature above the precipitation temperature of the alloy and the recrystallization stop temperature;

(e) a strip mill comprising a plurality of rolling stands for reducing a thickness of the rough-reduced product by a second amount, thereby producing a hot rolled steel sheet product, wherein the strip mill is in sufficiently close proximity to the heating apparatus that a temperature of the rough-reduced product entering the strip mill is above the precipitation temperature of the microalloy and the recrystallization stop temperature.

20. The apparatus of claim 20, wherein the heating apparatus comprises a heated run-off table onto which the rough-reduced product is received as it exits the rougher.